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1 **Self-localization from the panoramic views for autonomous mobile robots**
Kang-Hyun Jo; Hyun-Deok Kang; Inhyuk Moon;
Science and Technology, 2001. KORUS '01. Proceedings. The Fifth Russian-Korean International Symposium on , Volume: 3 , 26 June-3 July 2001
Page(s): 6 -9 vol.3

[Abstract] [PDF Full-Text (280 KB)] **IEEE CNF**

2 **Fast focal length solution in partial panoramic image stitching**
Duffin, K.L.; Barrett, W.A.;
Computer Vision and Pattern Recognition, 2001. CVPR 2001. Proceedings of the 2001 IEEE Computer Society Conference on , Volume: 2 , 8-14 Dec. 2001
Page(s): II-690 -II-695 vol.2

[Abstract] [PDF Full-Text (683 KB)] **IEEE CNF**

3 **Detecting path intersections in panoramic video**
Xinding Sun; Kimber, D.; Foote, J.; Manjunath, B.S.;
Multimedia and Expo, 2002. Proceedings. 2002 IEEE International Conference on , Volume: 2 , 26-29 Aug. 2002
Page(s): 529 -532 vol.2

[Abstract] [PDF Full-Text (672 KB)] **IEEE CNF**

4 **A multi-resolution outdoor dual camera system for robust**

4 **A multi-resolution outdoor dual camera system for robust video-event metadata extraction**

Marcenaro, L.; Marchesotti, L.; Regazzoni, C.S.;

Information Fusion, 2002. Proceedings of the Fifth International Conference on , Volume: 2 , 8-11 July 2002

Page(s): 1184 -1189 vol.2

[Abstract] [PDF Full-Text (623 KB)] **IEEE CNF**

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US-PAT-NO: 6043837
DOCUMENT-IDENTIFIER: US 6043837 A

TITLE: Method and apparatus for electronically distributing images from a panoptic camera system

DATE-ISSUED: March 28, 2000

US-CL-CURRENT: 348/36; 725/114 ; 725/91

APPL-NO: 08/ 852920

DATE FILED: May 8, 1997

---------- KWIC ---------

Abstract Text - ABTX:

An electronic image distribution apparatus for distributing panoramic images is disclosed. The central feature of the system is a panoramic image server coupled to a source of panoramic image information. The source of panoramic image frames may be a panoramic image storage device or a panoramic camera system. The panoramic image server converts the panoramic image frames into a format that is more conducive for electronic transmission. Specifically, the panoramic image server extracts a subset of each panoramic image frame and compresses that subset of the panoramic image. The panoramic image server may also geometrically transform the subset of the

panoramic image frame. The compressed subset of a **panoramic** image **frame** is transmitted across a transmission medium to a client system The client system **decompresses** the subset of **panoramic** image **frame** and displays the subset of the **panoramic** image **frame**. To conserve bandwidth, the panoramic image server compresses a large portion of the panoramic image frame and leaves a smaller portion of the panoramic image frame. The smaller portion of the panoramic image frame is later expanded by the client system.

Brief Summary Text - BSTX:

The present invention discloses an electronic image distribution apparatus for distributing panoramic images. The main portion of the apparatus is a panoramic image server that has a source of panoramic images. The source of panoramic image frames may be a panoramic image storage device or a connection to a of panoramic camera system. The server converts the panoramic image frames into a format that is more conducive for electronic transmission. Specifically, the server extracts a subset of each panoramic image frame and compresses that subset of each panoramic image. The server may also geometrically transform the subset of each panoramic image frame. The compressed subset of a panoramic image frame is transmitted across a transmission medium to a client system. The client system **decompresses** the

subset of **panoramic** image **frame** and displays the subset of the **panoramic** image **frame**. To conserve bandwidth, the server compresses a large portion of the panoramic image frame and leaves a smaller portion of the panoramic image frame. The smaller portion of the panoramic image frame is later expanded by the client system.

US-PAT-NO: 6219089
DOCUMENT-IDENTIFIER: US 6219089 B1

TITLE: Method and apparatus for electronically distributing images from a panoptic camera system

DATE-ISSUED: April 17, 2001

US-CL-CURRENT: 348/36; 348/39

APPL-NO: 09/ 344528

DATE FILED: June 24, 1999

PARENT-CASE:

This is a continuation of application Ser. No. 08/852,920, filed May 8, 1997 now U.S. Pat. No. 6,043,837.

---------- KWIC ---------

Abstract Text - ABTX:

An electronic image distribution apparatus for distributing panoramic images is disclosed. The central feature of the system is a panoramic image server coupled to a source of panoramic image information. The source of panoramic image frames may be a panoramic image storage device or a panoramic camera system. The panoramic image server converts the panoramic image frames into a format that is more conducive for electronic

transmission. Specifically, the
panoramic image server extracts a subset of each
panoramic image frame and
compresses that subset of the panoramic image. The
panoramic image server may
also geometrically transform the subset of the
panoramic image frame. The
compressed subset of a panoramic image frame is
transmitted across a
transmission medium to a client system. The client
system **decompresses** the
subset of **panoramic** image **frame** and displays the
subset of the **panoramic** image
frame. To conserve bandwidth, the panoramic image
server compresses a large
portion of the panoramic image frame and leaves a
smaller portion of the
panoramic image frame. The smaller portion of the
panoramic image frame is
later expanded by the client system.

Brief Summary Text - BSTX:

The present invention discloses an electronic image
distribution apparatus for
distributing panoramic images. The main portion of
the apparatus is a
panoramic image server that has a source of
panoramic images. The source of
panoramic image frames may be a panoramic image
storage device or a connection
to a of panoramic camera system. The server
converts the panoramic image
frames into a format that is more conducive for
electronic transmission.
Specifically, the server extracts a subset of each
panoramic image frame and
compresses that subset of each panoramic image.
The server may also
geometrically transform the subset of each

panoramic image frame. The compressed subset of a panoramic image frame is transmitted across a transmission medium to a client system. The client system **decompresses** the subset of **panoramic** image **frame** and displays the subset of the **panoramic** image **frame**. To conserve bandwidth, the server compresses a large portion of the panoramic image frame and leaves a smaller portion of the panoramic image frame. The smaller portion of the panoramic image frame is later expanded by the client system.

US-PAT-NO: 6043837
DOCUMENT-IDENTIFIER: US 6043837 A

TITLE: Method and apparatus for electronically distributing images from a panoptic camera system

DATE-ISSUED: March 28, 2000

US-CL-CURRENT: 348/36; 725/114 ; 725/91

APPL-NO: 08/ 852920

DATE FILED: May 8, 1997

---------- KWIC ---------

Abstract Text - ABTX:

An electronic image distribution apparatus for distributing panoramic images is disclosed. The central feature of the system is a panoramic image server coupled to a source of panoramic image information. The source of panoramic image frames may be a panoramic image storage device or a panoramic camera system. The panoramic image server converts the panoramic image frames into a format that is more conducive for electronic transmission. Specifically, the **panoramic** image server extracts a **subset of each panoramic** image **frame** and compresses that **subset of the panoramic** image. The **panoramic** image server may also geometrically transform the **subset of the**

panoramic image **frame**. The compressed **subset of a panoramic** image **frame** is transmitted across a transmission medium to a client system The client system decompresses the **subset of panoramic** image **frame** and displays the **subset of the panoramic** image **frame**. To conserve bandwidth, the panoramic image server compresses a large portion of the panoramic image frame and leaves a smaller portion of the panoramic image frame. The smaller portion of the panoramic image frame is later expanded by the client system.

Brief Summary Text - BSTX:

The present invention discloses an electronic image distribution apparatus for distributing panoramic images. The main portion of the apparatus is a panoramic image server that has a source of panoramic images. The source of panoramic image frames may be a panoramic image storage device or a connection to a of panoramic camera system. The server converts the panoramic image frames into a format that is more conducive for electronic transmission. Specifically, the server extracts a **subset of each panoramic** image **frame** and compresses that **subset of each panoramic** image. The server may also geometrically transform the **subset of each panoramic** image **frame**. The compressed **subset of a panoramic** image **frame** is transmitted across a transmission medium to a client system. The client system decompresses the

subset of panoramic image **frame** and displays the **subset of the panoramic** image **frame**. To conserve bandwidth, the server compresses a large portion of the panoramic image frame and leaves a smaller portion of the panoramic image frame. The smaller portion of the panoramic image frame is later expanded by the client system.

Detailed Description Text - DETX:

FIG. 4 also illustrates a second method of displaying motion pictures captured from a panoramic camera system. Specifically, FIG. 4 also illustrates system that extracts a **subset of panoramic** annular image **frame** information and distributes that **subset** of information as video **frames**. The video frames can be formatted for displayed on existing television screens and computer monitors.

Claims Text - CLTX:

a **panoramic** image converter, said **panoramic** image converter extracting a **subset of a panoramic** image **frame, said panoramic** image converter reducing a first portion of said **subset of a panoramic** image **frame, said panoramic** image converter sending said first portion of said **subset of a panoramic** image **frame** and a second portion of said **subset of a panoramic** image **frame**; and

Claims Text - CLTX:

a client system, said client system receiving said first portion of said **subset of a panoramic** image **frame** and said second portion of said **subset of a panoramic** image **frame,** said client system expanding said second portion of said **subset of a panoramic** image **frame,** said client system combining and displaying said first portion and said expanded second portion of said **subset of a panoramic** image **frame**.

Claims Text - CLTX:

3. The electronic image distribution apparatus as claimed in claim 1 wherein said **panoramic** image converter geometrically transforms said **subset of a panoramic** image **frame** from an annular representation to a rectangular projection representation.

Claims Text - CLTX:

4. The electronic image distribution apparatus as claimed in claim 1 wherein reducing a first portion of said **subset of a panoramic** image **frame** reduces said first portion to fit within a standard video **frame**.

Claims Text - CLTX:

6. The electronic image distribution apparatus as claimed in claim 1 wherein said client system transmits commands specifying an

area of said **panoramic**
image **frame** that should be extracted as said **subset of said panoramic** image
frame.

Claims Text - CLTX:

7. The electronic image distribution apparatus as claimed in claim 1 wherein
said **panoramic** image converter transmits said first portion and said second
portion of said **subset of a panoramic** image **frame** using a video streaming
program.

Claims Text - CLTX:

extracting a **subset of a panoramic** image **frame**;

Claims Text - CLTX:

reducing a first portion of said **subset of a panoramic** image **frame**;

Claims Text - CLTX:

transmitting said first portion of said **subset of a panoramic** image **frame** and a
second portion of said **subset of a panoramic** image **frame**;

Claims Text - CLTX:

receiving said first portion of said **subset of a panoramic** image **frame** and said

second portion of said **subset of a panoramic** image **frame** in a client system;
and

Claims Text - CLTX:

expanding said second portion of said **subset of a panoramic** image **frame** in said
client system.

Claims Text - CLTX:

geometrically transforming said **subset of a panoramic** image **frame** from an
annular representation to a rectangular projection representation.

Claims Text - CLTX:

10. The method of distributing electronic images as claimed in claim 8 wherein
said step of extracting a **subset of a panoramic** image **frame** extracts said
subset of a panoramic image **frame from a panoramic** image storage device.

Claims Text - CLTX:

11. The method of distributing electronic images as claimed in claim 8 wherein
said step of reducing a first portion of said **subset of a panoramic** image **frame**
reduces said first portion of said **subset of a panoramic** image **frame** to fit
within a standard video **frame**.

Claims Text - CLTX:

transmitting commands from said client system that specify an area of said **panoramic** image **frame** that should be extracted as said **subset of said panoramic** image **frame**.

US-PAT-NO: 6540681

DOCUMENT-IDENTIFIER: US 6540681 B1

TITLE: Extended view ultrasound imaging system

DATE-ISSUED: April 1, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Cheng; Xiangyong	Cupertino	CA	N/A	N/A
Lin; Shengtz	Cupertino	CA	N/A	N/A

APPL-NO: 09/ 721645

DATE FILED: November 24, 2000

US-CL-CURRENT: 600/443

ABSTRACT:

An extended view ultrasound imaging system in which a position sensor is used to detect the location and orientation of a ultrasound transducer for each scan frame as the ultrasound transducer is swept across the surface of a target. The contents of the successive scan frames, together with their location and orientation information, are processed to generate an extended view ultrasound image of the target region. An output array representing the extended view image is first initialized, and then

successively updated as each scan frame is received. In a preferred embodiment, an alpha-blending algorithm is used to combine the information in the current scan frame with previous output array values to generate the current output array values. Because the content of the successive image frames is not relied upon to piece them together, system processing requirements are substantially reduced and the output image is robust against increased transducer speed, bumps in the transducer path, and departures of the transducer from a common plane. In an additional preferred embodiment, the alpha-blending weighting factor can be user-adjustable and/or can be dynamically adjusted on a per-location basis based on acoustic reflectivity, edge motion, or other factors. Also in an additional preferred embodiment, the amount of departure from a common plane during the movement of the transducer across the target can be displayed to the user for assistance in interpreting the extended view image.

23 Claims, 7 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

---------- KWIC ---------

Brief Summary Text - BSTX (5):

Conventional ultrasound probes often have a limited field of view compared

to the target being imaged, and it is often difficult for a human observer to visualize the whole target from conventional displays of this limited field of view. Responsive to this problem, ultrasound imaging systems have been proposed that create extended view or **panoramic images** that are more useful in visualizing the target region as a whole. The extended view images are generated by piecing together sequential images taken as the probe is moved in a common plane across the target surface.

Detailed Description Text - DETX (9):

At step 308, the k.sup.th scan frame is generated and corresponding transducer coordinates (x, y, z, .theta., .phi., .gamma.) are detected. At step 310, the transducer coordinates (x, y, z, .theta., .phi., .gamma.) are **appended to the scan frame** data, which is then transferred to ultrasound processing unit 108. At step 312, ultrasound processing unit 108 operates on the received data using an algorithm described infra, generating an updated output array for real-time display at output device 110 and/or for subsequent storage and non-real-time viewing or processing. If the end of the visible display is reached, the image on the output display 110 is scrolled.

US-PAT-NO: 6081551

DOCUMENT-IDENTIFIER: US 6081551 A

TITLE: Image coding and decoding apparatus and methods thereof

DATE-ISSUED: June 27, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Etoh; Minoru	Katano	N/A	N/A	JP

APPL-NO: 08/ 731947

DATE FILED: October 23, 1996

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	7-277993	October 25, 1995

US-CL-CURRENT: 375/240, 375/240.13

ABSTRACT:

To achieve an image encoding apparatus that has extensibility by not limiting an image to be referenced, and that can reduce processing time satisfactorily if the processing of an ordinary frame is skipped, the apparatus of the present invention comprises: motion detecting means for detecting a motion vector for each block of a prescribed size

from a reference image and an input image; weighted motion-compensation means for, based on the detected motion vector, extracting from the reference image an area of a prescribed size which is wider than the prescribed block size and which contains an area corresponding to each block of the input image, and for creating a predicted image for the input image by applying a predetermined weight to each of pixels in the wider area and by using the weighted pixels of the wider area; a predicted-image memory for storing the predicted image; encoding means for taking a residual between the stored predicted image and the input image, and for encoding the residual; and decoding means for decoding the encoded image data and thereby obtaining a reference image.

4 Claims, 22 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 21

---------- KWIC ---------

Brief Summary Text - BSTX (23):

According to the invention, there is also provided an image encoding method wherein image data is divided into a representative frame representative of the image data and an ordinary frame other than the representative frame, and the representative frame and the ordinary frame are assembled as different bit streams, with frame identifying information for

identifying the respective
frames appended thereto, and are multiplexed
together for transmission.

Detailed Description Text - DETX (30):
FIGS. 6 and 7 are block diagrams showing the configuration of an image
encoding apparatus according to a second embodiment of the present invention,
and FIG. 8 is a block diagram showing the configuration of an image decoding
apparatus corresponding to the image encoding apparatus. Major differences in
this embodiment from the foregoing first embodiment are that the ordinary frame
and template are processed separately and the data are packetized and output as
different bit streams, and that an error-detecting code is **appended to the ordinary frame** and an error-correcting code to the template.

Detailed Description Text - DETX (31):
In addition to the configuration of the image encoding apparatus of FIG. 1,
the image encoding apparatus of FIG. 6 further includes: an input selection
switch 30 which switches the input image depending on whether the input image
is an ordinary frame or a template; an output buffer 31 for an ordinary frame;
an error-detection coding packetizer 32 for packetizing ordinary **frame data by appending** an error-detecting code to it; and a MUX 33 for multiplexing ordinary
frame packet data and template packet data together for output. On the other
hand, the template updating switch 19 shown in FIG. 1 is omitted.

Detailed Description Text - DETX (38):

First, in the present embodiment, as shown in FIG. 9, the ordinary frames, p0 to p6, and the templates, t0 and t1, which are the same as p0 and p4, are processed as different bit streams. The data are packetized; more specifically, as shown in the packet structure of FIG. 11, an identifier for identifying between an ordinary frame and a template is contained at the head of the packet, which is followed by a frame number indicating the sequence of playback. Next, in the case of a template, a Reed-Solomon error-correcting code is **appended to the data, whereas in the case of an ordinary frame,** the frame number of the template that the ordinary frame refers to and a CRC error-detecting code are appended. The error-correcting code is appended only for the template, and the error-detecting code is **appended for the ordinary frame,** because the data amount of the error-correcting code is larger than that of the error-detecting code.

Detailed Description Text - DETX (49):

FIG. 12 is a schematic diagram showing relations between images to be processed and a template according to a third embodiment of the present invention. This embodiment is an extension of the foregoing second embodiment, and is intended for application where the template is a **panoramic image** or the like larger than an ordinary **frame,** for example, when ordinary **frames** p0 to p6

use a single template t0 as a reference, as shown in FIG. 12, or where reference blocks can be specified in advance in the reference **image**. FIG. 13 is a diagram showing processing timing for the images shown in FIG. 12; in the process shown, during the decoding of the template t0 the ordinary frames are sequentially decoded, starting with p0, for presentation for display.

Detailed Description Text - DETX (50):

To implement this, information indicating the upper left position and lower right position of a macroblock containing a template sub-region to be referenced (see FIG. 14) is **appended, for example, at the head of each ordinary frame** packet. Likewise, information indicating the upper left position and lower right position of the macroblock that a transmitted sub-image occupies in the entire image is appended to each template packet so that the sub-image necessary for the decoding of the template can be decoded in advance. How the template image is divided into sub-images is at the discretion of the encoding end. Assuming that the encoding and decoding of the template are performed on each divided sub-image independently, and that the numbers of macroblocks in both horizontal and vertical directions of the entire image are known, the decoding sequence of the template can be uniquely reconstructed from the frame number and the information indicating the upper left and lower right positions of each associated macroblock. Whether the reference regions in the template

are constructed with correct timing is also dependent on the bit stream construction at the encoding end; on the other hand, at the decoding end, whether an ordinary frame can be played back or not can be determined based on the header data of the ordinary frame packet using the frame number of the reference template and the range of the reference macroblock carried in the packet.

Claims Text - CLTX (2):
said representative **frame** including a **panoramic image** larger than said second **frame,**

Claims Text - CLTX (5):
frame identifying information for identifying the representative **frame and the second frame, respectively, appended to said first residual frame** and said second residual frame,

Claims Text - CLTX (6):
block identifying information for identifying a block in said representative **frame, appended to said second residual frame,** and

Claims Text - CLTX (15):
(a) dividing input **image** data into a representative **frame** and a second **frame,** the representative **frame** including a **panoramic image** larger than the second **frame,**

Claims Text - CLTX (22):
(h) **appending data to the second residual frame** for indicating a block in the representative frame to be referenced by the second residual frame,

Claims Text - CLTX (23):
(i) combining the encoded first residual **frame, the encoded second residual frame and the appended** data in a multiplexer and

Claims Text - CLTX (24):
(j) transmitting the combined **frames and the appended** data.

US-PAT-NO: 6081551

DOCUMENT-IDENTIFIER: US 6081551 A

TITLE: Image coding and decoding apparatus and methods thereof

DATE-ISSUED: June 27, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Etoh; Minoru	Katano	N/A	N/A	JP

APPL-NO: 08/ 731947

DATE FILED: October 23, 1996

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	7-277993	October 25, 1995

US-CL-CURRENT: 375/240, 375/240.13

ABSTRACT:

To achieve an image encoding apparatus that has extensibility by not limiting an image to be referenced, and that can reduce processing time satisfactorily if the processing of an ordinary frame is skipped, the apparatus of the present invention comprises: motion detecting means for detecting a motion vector for each block of a prescribed size

from a reference image and an input image; weighted motion-compensation means for, based on the detected motion vector, extracting from the reference image an area of a prescribed size which is wider than the prescribed block size and which contains an area corresponding to each block of the input image, and for creating a predicted image for the input image by applying a predetermined weight to each of pixels in the wider area and by using the weighted pixels of the wider area; a predicted-image memory for storing the predicted image; encoding means for taking a residual between the stored predicted image and the input image, and for encoding the residual; and decoding means for decoding the encoded image data and thereby obtaining a reference image.

4 Claims, 22 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 21

---------- KWIC ---------

Detailed Description Text - DETX (49):

FIG. 12 is a schematic diagram showing relations between images to be processed and a template according to a third embodiment of the present invention. This embodiment is an extension of the foregoing second embodiment, and is intended for application where the template is a **panoramic image** or the like larger than an ordinary **frame,** for example,

when ordinary **frames** p0 to p6
use a single template t0 as a reference, as shown in FIG. 12, or where
reference blocks can be specified in advance in the reference **image**. FIG. 13
is a diagram showing processing timing for the images shown in FIG. 12; in the
process shown, during the decoding of the template t0 the ordinary frames are
sequentially decoded, starting with p0, for presentation for display.

Claims Text - CLTX (2):
said representative **frame** including a **panoramic image** larger than said
second **frame,**

Claims Text - CLTX (15):
(a) dividing input **image** data into a representative **frame** and a second
frame, the representative **frame** including a **panoramic image** larger than the
second **frame,**

Claims Text - CLTX (22):
(h) **appending data to the second residual frame for indicating** a block in
the representative frame to be referenced by the second residual frame,